



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## THE ISLANDS OF THE MID-PACIFIC

BY DR. ALFRED GOLDSBOROUGH MAYER

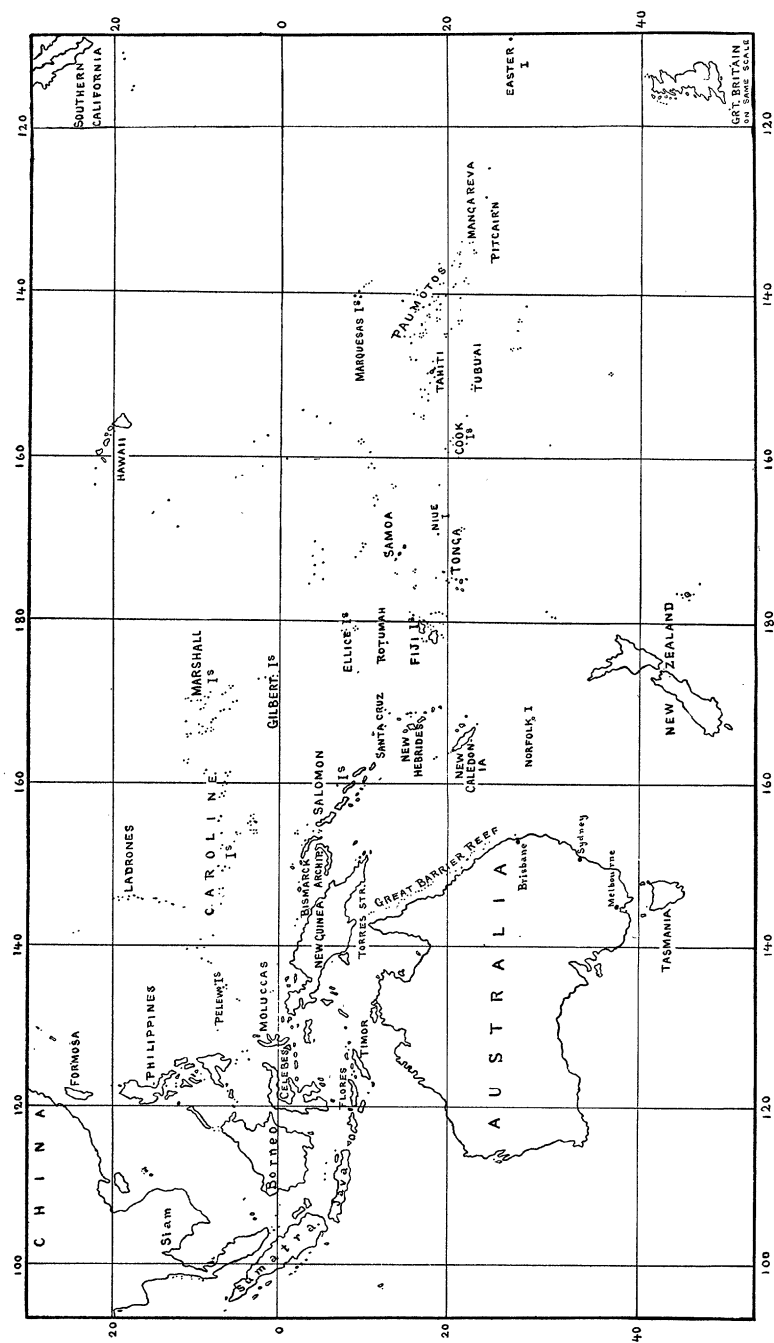
THE map of the mid-Pacific shows about eight hundred small islands dotting the expanse of the tropical sea. So prominent do these appear upon the chart with their names stretching over hundreds of miles that the voyager is surprised to find that they are in reality all but lost upon the vast area of the waters. Thus it was that in 1521 Magellan sailed 8,000 miles across the ocean and saw only four small uninhabited islets until he came upon the Ladrões in the far eastern Pacific.

During the century that elapsed after Magellan's voyage, only two important mid-Pacific groups, the Marquesas and the Paumotos, were discovered, for the explorers made the best speed they could with the southeast trade wind from the coast of South America, and such a course even from Cape Horn carries one to the northward of the great archipelagoes which lie in the tropical regions of the southern hemisphere.

Yet in the Pacific even in these days of steam, there stretches for days and weeks around one only the monotony of sea and sky, and it is with the delight of surprise that the far mountain peak is seen looming cloud-like through the haze, or, if the island be an atoll, a ragged row of cocoanut palms thrusts suddenly above the long line of the horizon.

Apart from such large land masses as New Caledonia and New Zealand, which contain continental rocks, the islands of the mid-tropical Pacific are either volcanoes, or elevated limestone reefs, or low-lying atolls which are believed to rest upon the submerged peaks of extinct volcanoes.

Sir John Murray tells us that the area of the Pacific is about 69,000,000 square miles, 65 per cent. of which is between 12,000 and 18,000 feet in depth. Indeed, the floor of the ocean between the Galapagos and the Paumotos is a plain in comparison with which the wide levels of Russia and of our Middle States are diversity itself. This vast flat bottom of the eastern Pacific is the widest area of deep water upon earth. Asia, Africa, and North and South America might all be sunken beneath it and not overlap. Indeed, one might sail nearly 8,000 miles south-eastward from Behring Strait to the Antarctic, and for 7,000 miles of the course the least depth would be 12,000 feet, and at no place would the bottom be within a mile of the surface. The continental shores rise abruptly from this deep, floor, and in a few places we find trough-like or pit-like depressions sunken far below the bed of the sea, or an isolated volcanic cone rises dome-like from the plain, but the diversified



ISLANDS OF THE PACIFIC.

landscape of hill and valley has no counterpart in the hidden world beneath the sea.

The deepest regions of the oceans are commonly close to the shore and are believed to have been caused by the crumpling inward of the earth's crust due to the pressure of the near land. Such is the "Tuscarora Deep," a long narrow trough which extends northward from Japan along the coast of Asia; its bottom being more than 27,600 feet below the surface of the sea and 12,600 feet below the general level of the ocean's floor. An even more profound abyss is the Aldrich Deep close to the Tongan and Kermadec Islands which sinks to a depth of 30,930 feet. The greatest yet found, however, is the Swire Deep off Mindanao of the Philippines, this being 32,089 feet or 3,089 feet deeper than Mount Everest of the Himalayas is high.

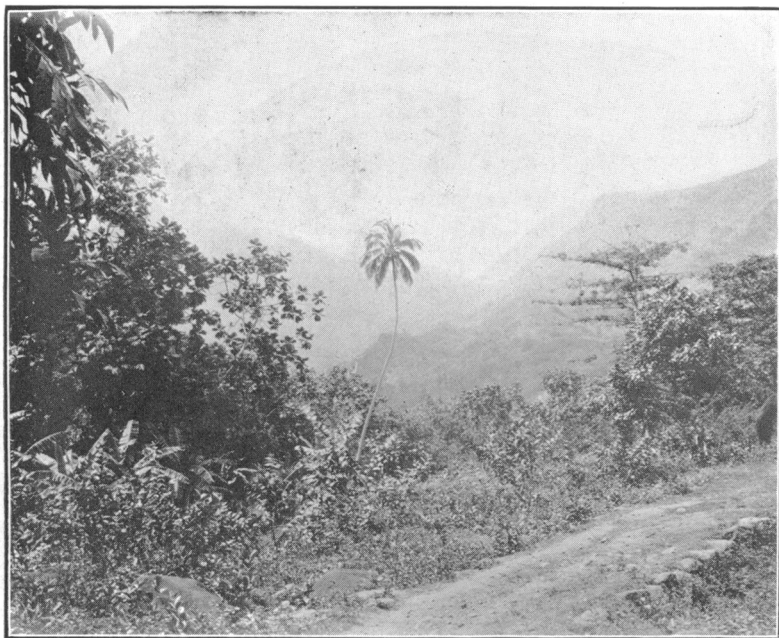
However, one gains an idea of the rarity of such abyssal regions from the fact that of the 9,750 soundings that have been made and reported in water over 1,000 fathoms in depth, only 17 were greater than 4,000 and only 3 exceeded 5,000 fathoms in depth. The greatest recorded depth of the ocean is only 409 feet more than six miles.

By contrast with these troughs and pits, submerged plateaus rise gently above the general level of the ocean floor, and here and there and at rare intervals a mountain obtrudes above the submarine plain. All these isolated mountains are volcanoes and thus every truly oceanic island is but the summit of a pyramid thrown upward until its corroding peak may rise 13,800 feet above the sea as does Mauna Kea in Hawaii, or if now submerged, it may be capped by a thickness of several hundred feet of limestone and coral as in Bermuda.

The fairest islands in all the tropic world are those of Marquesas and Tahiti, where jagged sheets of basalt tower in grotesquely sculptured precipices thousands of feet above the soft lavas and tufas that the rains have washed away. Long ago these islands were volcanoes of an explosive type such as *Ætna* of to-day, and molten basalt welled upward from the depths and filled the gaping rents in the pyramids of softer ash and lava. Then, after the fires had died, the tropical rains began their slow persistent work so that to-day deep valleys wind sinuously downward from the summits to the sea, and the sound of rushing brooks is forever upon the ear. Green as corroding malachite set in the azure of the sea, the splendid peaks and shaded gorges lie mantled in the soft mist-loving verdure of the tropics, where the banana, orange, bread-fruit, mango, kavika, alligator pear, and Tahitian chestnut grow in wild profusion.

The surf in these tropical regions is far less destructive than along our own frost-ravaged shores, for this is the domain of coral reefs, and many a crumbling volcanic cone lies protected within an encircling break water upon which the wave is smothered into foam, leaving only ripples to reach the palm-fringed shore.





TAE-O-HAE VALLEY, NUKUHIVA ISLAND, MARQUESAS.

Sheltered thus from the wear of the sea, lies the slumbering volcano whose fires have been dead for many a thousand years. At night, the cool air of its mountain heights wafts downward to the sea, fragrant with jessmine and spice, and all the subtle perfume of a tropic wild. By day the sea-breeze assumes the mastery, and awakens the snowy flash of breakers where the rollers die into wavelets a mile or more from shore. This silvery line of surf marks the position of the barrier reef which encircles the island, leaving a calm and shallow channel between the reef-rim and the shore. Here protected the native plies his frail canoe, knowing as he does all the haunts of the fish among the coral clusters which here and there rise abruptly from the depths to the surface; and on calm days we may wade along the outer edge over many a place where a single seaward step would plunge one into water a hundred feet in depth.

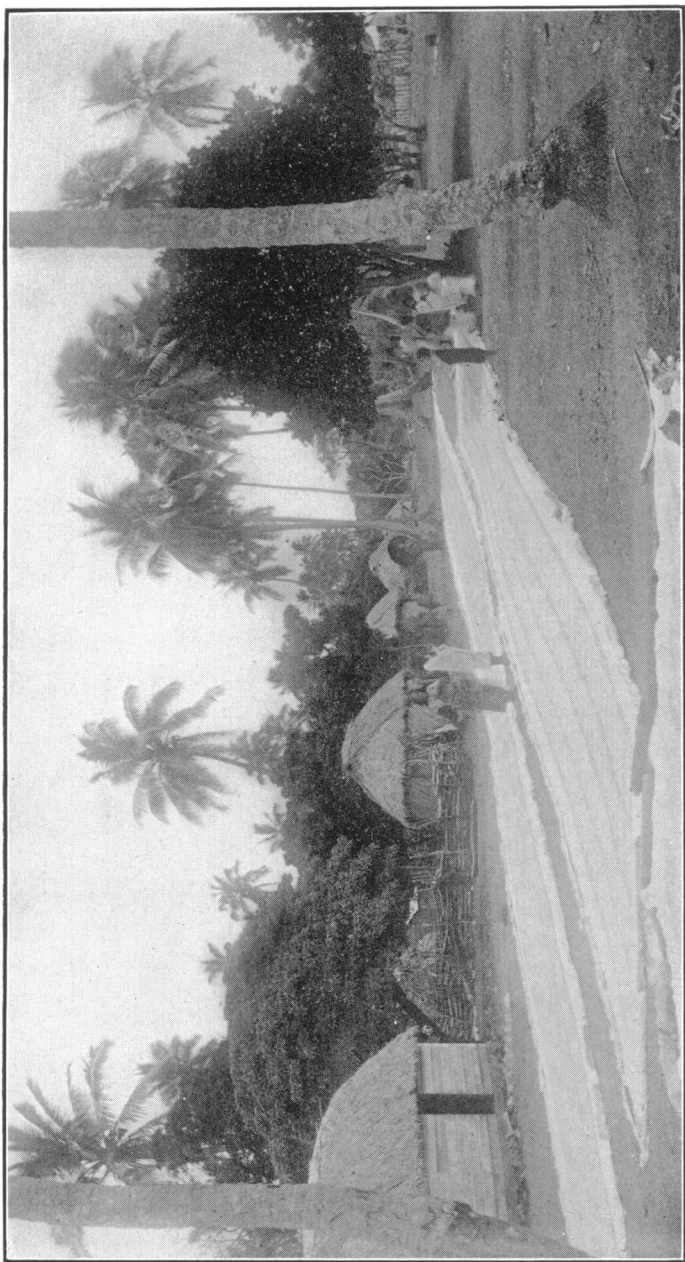
Rich coral reefs usually occur in inaccessible places and are so studiously shunned by commercial vessels that the ordinary traveler has but little opportunity of seeing them at close range. The living corals rise in clusters above the volcanic rock or limestone upon which they have acquired an anchorage. They are, as is well known, animals closely related to sea-anemones, and their young when as small as a pin's head, are cast out into the water as little pear-shaped larvæ covered with vibrating cilia. After being drifted by currents and swimming feebly for a few days, the little creature settles down upon the bottom and soon grows

into a minute sea-anemone-like animal whose skin secretes lime and thus forms a skeleton, and it is this stony support, after the animal itself has died, that we commonly call "coral." After it has become attached to the bottom, the little polyp acquires tentacles which surround the mouth and then it begins to grow either into a simple form, or by budding to assume a shape in accordance with the habit of its species. At first but a single polyp it buds or divides so that there may be thousands of such with their stomachs more or less connected. Thus the animal is a colonial one, and when one polyp captures a minute crustacean, the other polyps in its neighborhood share in the benefit. Doctor T. Wayland Vaughan, who has studied them most carefully, tells us that corals are voracious creatures and feed upon almost any small floating animal they can capture, but plants they will have none of for they are strictly carnivorous.

Olive and yellow-greens, mauve and purple-browns are the colors of the living corals. Glinting they lie in the limpid water with the glistening white of limestone sands around them. Here and there accentuating the color of the scene is a deep blue starfish (*Linckia*), or a flower-like sea-anemone a foot or more in width beautifying a crevice with tracery rivaling old Venetian glass, while closely wedged within its special cavern lies the giant clam (*Tridacna*), the sinuous cleft between its valves, a zigzag of malachite and blue, green or mottled brown. Among the corals, one finds delicate forests of fused branches rich purple-brown with pink and snowy tips (*Acropora*), or green-olive and yellow-green nodular forms such as *Porites*, *Orbicella*, or *Goniastrea*. Some of



CANOES AND WARRIOR OF UOLA ISLAND, TRUK GROUP, CAROLINE ISLANDS.



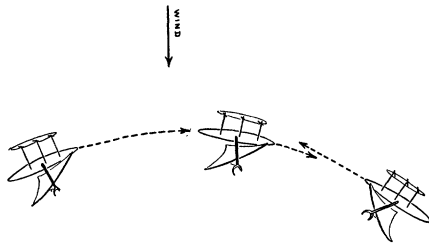
SHEETS OF TAPA BEING PRINTED AND PRINTED IN ANTICIPATION OF THE WEDDING OF A CHIEF. Tongatabu Island, Tonga.

the species of *Porites* upon the Great Barrier Reef of Australia are twenty or more feet in diameter and must surely have been a century in growing, for it is known that in Torres Straits under favorable conditions they may enlarge in diameter at the rate of nearly two inches per annum.

Silt and drifted mud are fatal to corals, for they stifle the feeding polyps and the dead surface is soon honeycombed by a host of worms and weeds and mollusks, so that the base of each old coral-head is cavernated with intricate retreats which form the home of the reef fish—those living jewels of the tropical sea, rivalling the butterflies in color.

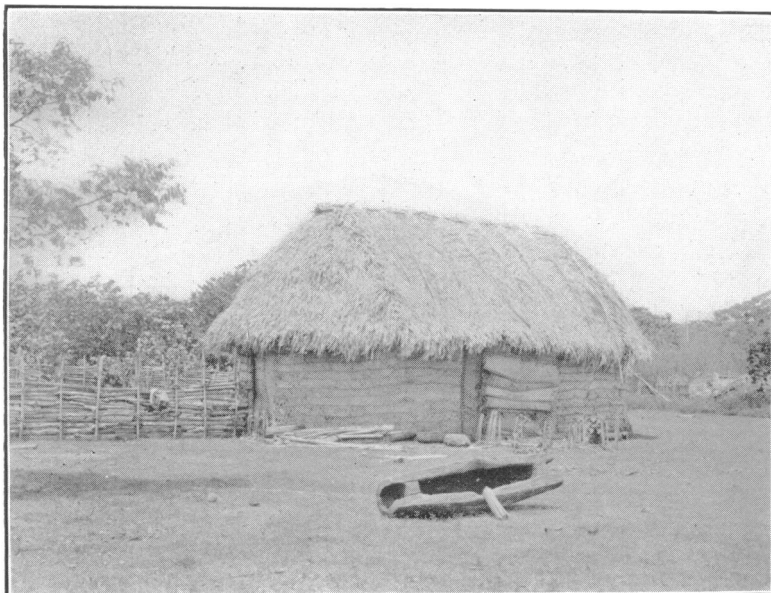
Opposite the mouth of every mountain stream, we find an opening in the wall of the encircling reef; for the outflow of brackish water and silt prevent the growth of corals in such places and thus a harbor is formed. Here nestled under the shadows of palm trees close to the protected shore lie the thatched houses of the natives, resembling haystacks as one sees them from afar.

Drawn up in an irregular line, for all is hap-hazard in the South Seas, lie the canoes of the village, carved in strange symbolism to propitiate gods and tribal heroes. Each has its slender outrigger ingeniously constructed, a marvel of flexibility and strength, and its sail woven of pandanus leaves is carefully covered under a matting to protect it from the molding due to damp. In sailing, the outrigger is always on the windward side, and the sail itself is never reefed, but instead one, two or three men place themselves upon the outrigger. Breezes are known therefore as "one," "two," or "three-man winds." A high degree of skill is required in sailing these canoes, for the outrigger must skim lightly through the water. Should it rise into the air, the canoe over-



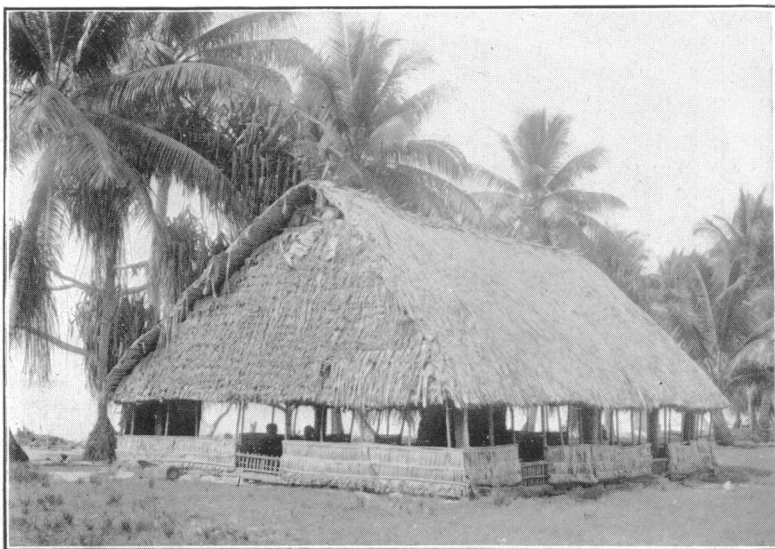
MODE OF TACKING AN OUTRIGGER CANOE.

turns, and if it sinks, a sudden luff capsizes the navigators; not, however, a serious accident where all are swimmers from earliest childhood. As the outrigger must always remain upon the weather side the method of tacking is curious, for instead of luffing up into the wind, they put the helm up and hold the canoe off until the wind is abaft. Then the "tack" or lower point of the lateen sail is carried aft and tied down; and the canoe starts backward, that which was the stern now becoming the bow.



HOUSE AT EUA ISLAND, TONGA, showing a wooden drum and drumstick in the foreground.

Such is the life of man upon the "high islands" of the tropical Pacific, and as for the islands themselves, the fascination of their isolation is the keynote of their charm, set as they are in the amethystine blue of the coral sea that flashes into emerald over shallows near the shore.



THE COUNCIL HOUSE, FUNAFUTI ATOLL, ELLICE ISLANDS.

Forests rich with fruit, and many a stream and coral reef afford sustenance in abundance to the natives of these favoured regions of the tropical Pacific.

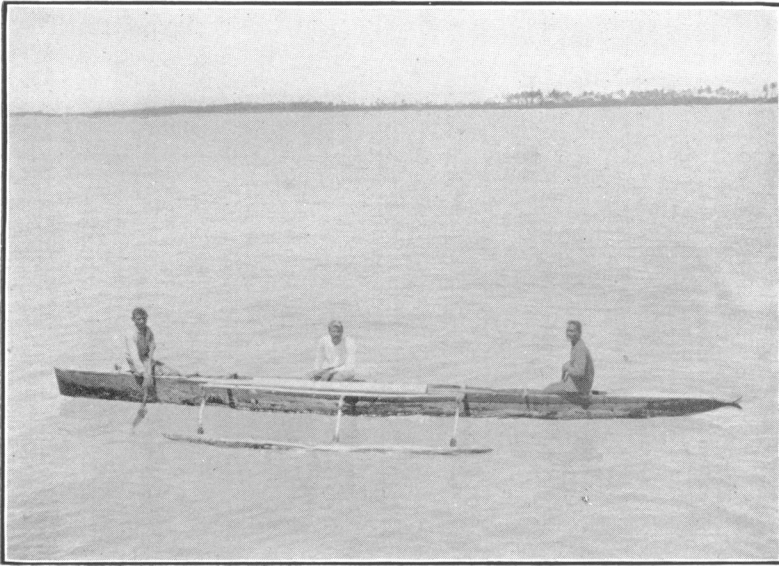
But there is another, much commoner, and wholly different type of island—the atoll. The popular idea that atolls are circular or regularly elliptical in outline is false, for they commonly consist of a straggling line of long, low islets enclosing with many breaks an irregularly-shaped basin, or lagoon, the bottom of which is quite level and about one hun-



A HOUSE OF FUNAFUTI, ELLICE ISLANDS.

dred feet in depth, although often many miles in width. Another erroneous impression is that the islets are composed mainly of coral. Broken fragments of corals are cast upon their shores, it is true, and may form an irregular wall twelve or more feet in height along the seaward beach, but usually the bulk of the material forming the islets is composed of fragments of shells, calcareous plants, and other organic limestones which after being churned and pounded in the surf are finally tossed up by wave and wind, above the reach of the sea.

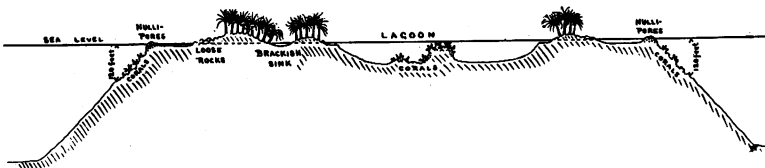
Darwin thought that atolls owed their formation to subsidence. He imagined a coral reef encircling a volcanic cone. Then should the volcano slowly sink beneath the sea, the ring of coral would as constantly grow upward until finally the central mountain would disappear leaving only the ring of the coral reef. Simple as this hypothesis appears upon paper, it does not accord with the observed facts, for it



THE FISH-TAILED CANOE OF FUNAFUTI ATOLL, ELLICE ISLANDS.

fails to explain the remarkable flatness of the bottom of the lagoon with its prevalent uniform depth of 20 fathoms.

The general seaward slope of the atoll is nearly  $45^\circ$ , so that one commonly finds a depth of three quarters of a mile within a mile from shore. Only the upper part of this slope is, however, covered with living reef-corals and these form a mere veneer between depths of 120 feet and the surface. Indeed, the upper rim of the reef is apt to project as a low ridge several inches above high tide. This ridge is dull red in color, and consists in a dense growth of stony sea-weed, *Lithothamnion*, and nullipore.



DIAGRAMMATIC SECTION OF A TYPICAL PACIFIC ATOLL.

Between the nullipore ridge and the shore there is a submerged platform over which the breakers drive so fiercely during storms that few corals can cling within its scanty crevices. This platform is usually from one hundred to six hundred feet wide and its floor is commonly not more than three feet in depth at low tide. The seaward beach of the island is a chaotic mass of dead and broken coral-heads which have

been torn from the outer reef and driven inward over the platform to be cast high above the wash of ordinary waves. On the lagoon side, also, we sometimes find the same conditions repeated upon a miniature scale; the slope, the platform, and the wave-raised coral-heads being similar to the corresponding formations of the seaward side of the islet, but the nullipore rim is commonly absent from the lagoon side for these limestone-making plants thrive only in heavy breakers.

In the center between the seaward and lagoon-ward ridges, one finds the lowest part of the islet, this region often being below sea level, and forming a brackish swamp, whose noxious waters constitute the only drinking supply of the atoll.

Brain corals and other huge, massive forms grow close to the seaward edge of the reef, where the surges dash over and among them, but the forests of fragile stag-horns (*Acropora*) thrive best in more protected places. Others called the *Fungüdæ* are attached, only in early life, by a slender stalk which soon breaks, and they then lie loosely upon the reef like petrified mushrooms pushed about at the caprice of the waves. Others (*Siderastrea*), called "rolling stone corals," may break loose and be rolled about, the upper side always regenerating and growing so that the mass becomes egg-shaped or spherical. In general, however, as has been shown by Vaughan and others, the small branching and slender forms must grow either at considerable depths or in protected places to withstand the rough treatment of the sea, thus the deep parts of the seaward precipices of the coral reef are



A CANOE UPON THE LAGOON BEACH OF FUNAFUTI ATOLL, ELLICE ISLANDS.





A BELLE OF FUNAFUTI, ELLICE ISLANDS.

covered with fragile corals, *Oculina*, and *Eusmilia*, and the leaf-like *Turbinaria* and *Agaricea* secure in their quiet depths beneath the agitation of the storm.

Reef corals do not commonly grow, however, at depths greater than 100 feet, and indeed the most flourishing are in water less than six feet deep, and some are even laid bare at the lowest tides. In times of hurricanes vast masses of broken coral are caught in the rush of the waters and tossed far up upon the outer edges of the reef flats, and rocks weighing tons may thus be lifted fully fifteen feet above the level of

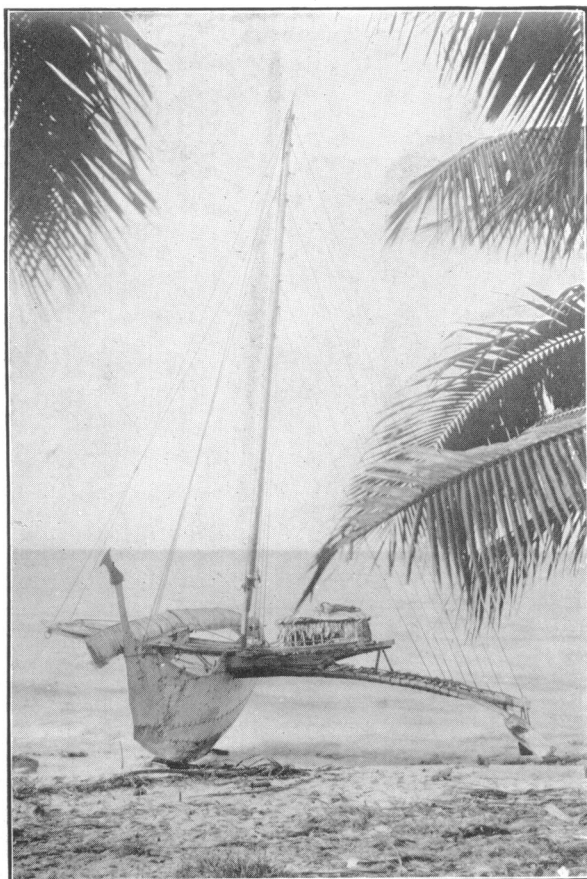
the sea. In this manner the originally submerged rim of the reef has in some places gradually been raised, new corals growing upon the shattered fragments of the old, but we must always remember that the slow persistent effects of everyday conditions have far more to do with shaping atolls than have hurricanes.

In coral reef regions, the bottom of the sea is often found to be covered with fine white limestone mud. This becomes converted into rock and may form plateaus thousands of square miles in area and hundreds of feet thick as in the Bahamas and in Florida. This chalky deposit was formerly called "coral mud," but recently, Drew and Kellerman have shown that it has no relation to corals, for according to these authors the warm surface waters of the tropical ocean are infested with bacilli which set up a complicated chemical reaction that enables the calcium to combine with the dissolved carbon dioxide and to form a chalky precipitate, the myriad little granules of which may possibly cause the wonderful blue color of the tropical sea. In any event, in the Atlantic this precipitate sinks to the bottom and there forms into oolite in the manner described by Linck and by Vaughan.

It may be of interest to observe that the relative paucity of nitrogen in the waters of the tropics may account for the few seaweeds found in warm regions, for nowhere in the tropics are there anything like the kelps and fucus that cover the rocks of the north Atlantic shores of Europe and America. Also the scarcity of plant life in the tropical ocean is correlated with the comparative absence of the swarms of floating marine animals such as are so characteristic of Arctic seas, for in cold seas individuals are abundant, but species are few, whereas in the tropics there are many species, but most of them are rare.

In the tropics, where frost is unknown, the moist shell-sand of the beaches is dissolved by rain water and then precipitated, the fragments becoming cemented into a solid rock-mass, this action being especially noticeable between tidal levels, but by no means confined to such places, for in the Bahamas hills several hundred feet high have been formed in this manner out of wind-blown shell-dust and limestone particles. Indeed, rain water charged with carbonic acid derived from the decomposition of vegetation dissolves limestone and thus each little grain of shell-sand is partially dissolved, and then, if the water evaporates or the limestone be precipitated, the grains become cemented one to another by little bridges of calcium carbonate, and thus a *Coquina* is formed, such as one may see at St. Augustine in Florida, and on most of the atoll islands of the world.

Currents, waves, and winds have much to do with the building up of the islets of the atolls. The waves press constantly over the rim, and the basin of the lagoon is filled to overflowing, so that most of the water thus driven into it must escape on the leeward side. Accord-



CANOE DRAWN UP UPON THE BEACH AT RONGELAB ATOLL, MARSHALL ISLANDS. The sail is covered with a thatch of pandanus leaves to protect it from rain. The little deck-house on the outrigger is for storing food when voyaging.

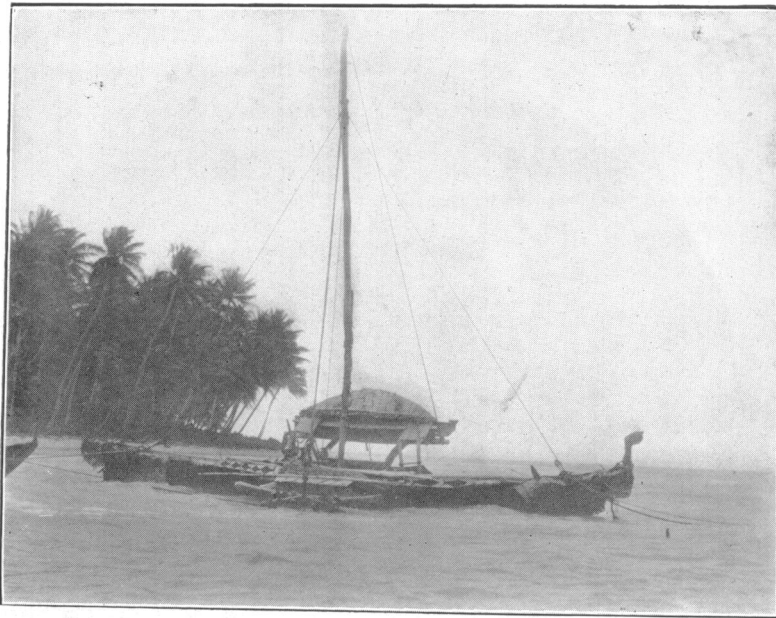
ingly, the deepest openings are always so placed that we must beat up into the wind in attempting to enter the lagoon. Practically every deep entrance into a Pacific lagoon is partially blocked on the inner side by an islet which has formed in the vortex from materials drawn together by the outrushing water.

Even when the tide is high, there is apt to be an outflow of water through all openings on the leeward side of the atoll, but at low tide the whirlpools and breakers in such places are often fearful to behold.

In opposition to Darwin's theory, an hypothesis, prominently presented by Professor Reginald A. Daly, is gaining ground. This states that the great polar ice-caps of the glacial period must have been formed from water taken up from the ocean by evaporation to constitute the snows of the polar regions. Thus the level of the trop-

ical oceans of those days may have become about 120 feet lower than at present. Now, if this were the case, the sea would wash away the shores, forming platforms at sea level for the corals being mainly killed by the low temperature could not protect the Island from the waves. Then, when the ice-caps melted and the ocean rose and again grew warm the corals growing upon the outer edges of these platforms formed the present atolls and barrier reefs. If this be true, all the modern coral reefs are upon platforms which the corals themselves did not build up, but upon which they merely grew after the glacial epoch. In confirmation of this, Andrews has shown that the platform upon the seaward edge of which the barrier reefs of Australia have grown, extends southward beyond the latitude of coral growth. We may observe that it also extends northward to New Guinea, beyond the region where the corals are killed by the silt from the Fly River. Dr. Vaughan has also demonstrated that the platform upon which the Florida reef has grown extends northward from Fowey Rocks into a region too cold for corals, and he shows that this relation appears to be general among coral reefs.

As one approaches the atoll presents a charming picture. At first only a line of cocoanut palms seemingly arising out of the ocean itself. Then the white glint of sandy beach and, finally, we sail through a narrow opening and find ourselves securely anchored in the limpid



SEA-GOING WAR-CANOE OF UOLA ISLAND, TRUK GROUP, CAROLINE ISLANDS. Canoe 25 feet long.

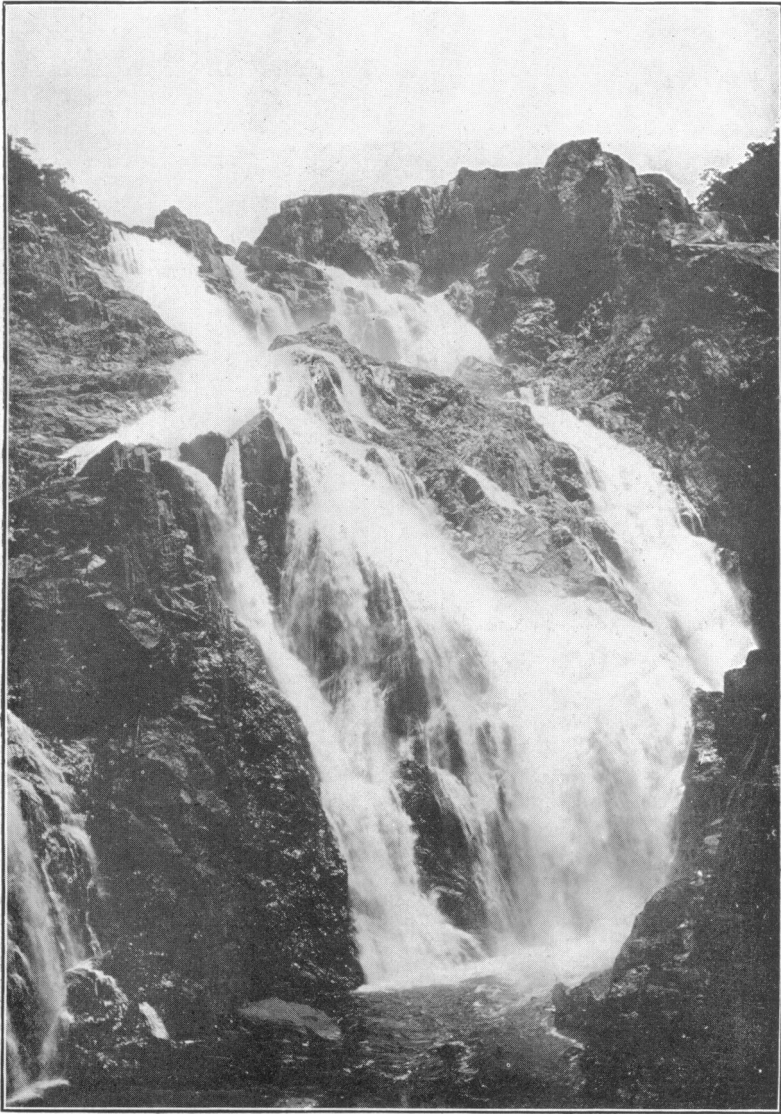


PRIMEVAL FOREST OF QUEENSLAND, NEAR KURANDA.

waters of the calm lagoon surrounded by a narrow broken ring of islets.

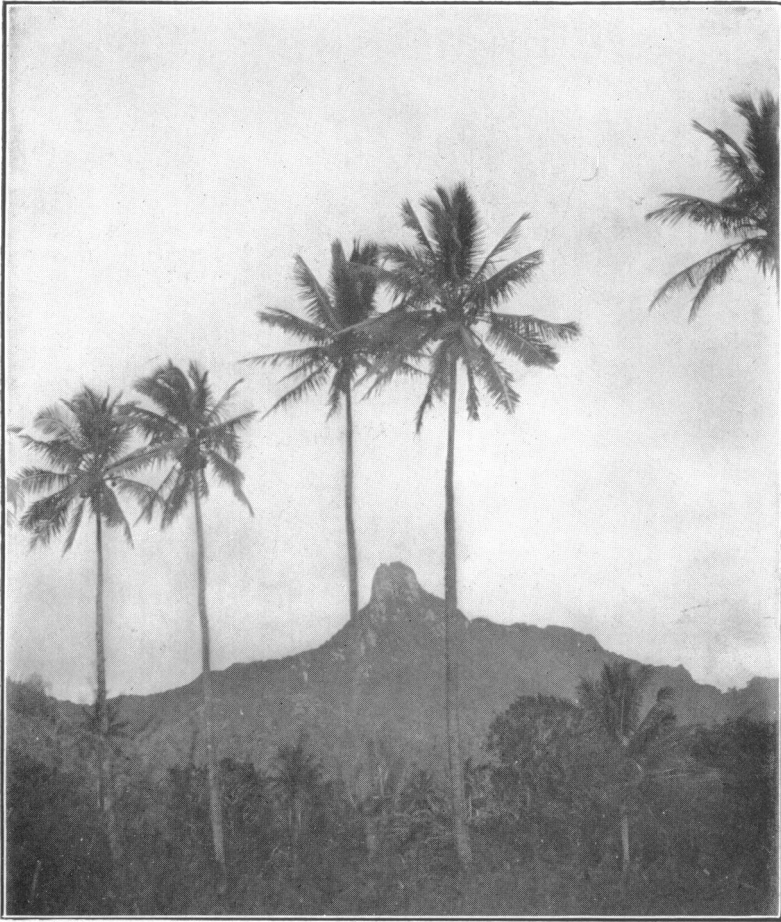
Glistening and brilliant it lies with the sunlit sea around it, a shimmer of turquoise and emerald set in the everlasting blue of the Pacific where the flash of flying spray gives action to the scene. With its palm groves bending to the breeze, its alabaster beach, and by contrast the soft colors of withered thatch where palm-leaf houses nestle beneath the shade along the lagoon's shore. All splendid and sparkling, none can resist the invitation of its charm.

But once on land, one is doomed to disappointment. The natives



BARRON FALLS, QUEENSLAND, AUSTRALIA, IN THE DRY SEASON. These falls are about 700 feet high.

are starved and sickly in comparison with their more favored cousins of the high islands. The scintillating heat of the blistering sands, the sparse and thorny plants of less than fifty kinds, redeemed only by the cocoanut and the pandanus, without which man must starve or die of thirst—all illusions vanish in the stifling of the barren, glaring, thorny place and we long for the ship's cool deck and the awning's gracious shade. Life is poor and dull upon these atolls, rarely more than an



COCOANUTS AND OLD VOLCANOES OF RARATONGA, COOK ISLANDS.

eighth of a mile wide, with neither hills nor valleys, without streams or springs, and with the heavy murmur of breakers forever in one's ears.

Pure drinking water is the most prized luxury of the atoll. To obtain it, the natives cut furrows extending diagonally down the stems of cocoanut palms and leading into a cavity cut in the trunk of the tree, within which a few ounces may collect. Failing of this meagre supply, they resort in time of drought to the mosquito haunted swamps which occur here and there in the center of the islet.

Thus it is that the natives of the atolls are less cultured, less interesting and poorer both in material and intellectual things than are their relatives upon the high volcanic islands.

An intermediate geological condition is seen in another type of island which the non-geological traveler is apt to confuse with the volcanic, but which is actually only an elevated atoll or coral reef. In vol-



canic regions, considerable local oscillations of level are common and it is known that between the fifth and the twelfth centuries long stretches of the shore of the Bay of Naples sank forty feet beneath the sea and then rose 20 feet above its lowest level. In the Pacific greater oscillations have occurred, for some of the coral reefs of the Fijis are now more than eight hundred feet above the ocean, and other examples of elevated atolls or coral reefs are found in Niue, Eua and Vavau in Tonga, and in Makatea of the Paumotos islands.

In these elevated coral islands, bold precipices of dull gray limestone frown gloomily upon the sea, their hostile walls stained here and there a rusty red where coral heads have decomposed, leaving the ruddy stain of iron. Caverns with stalactytes drooping like curtains from their roofs are found along the steep face of the cliff, and within them the chiefs of other days lie buried. In places the sea gains access to these caverns, and in the darkened pools live some of the creatures whose true home is upon the dimly-lighted bottom of the sea, 1,000 feet below the surface. Yet here in the everlasting shade flower-like crinoids crawl slowly over the rocks, and long, lythe sea-whips (*Alcyonaria*) coil and uncoil in the dying surge that wanders to their far retreats.

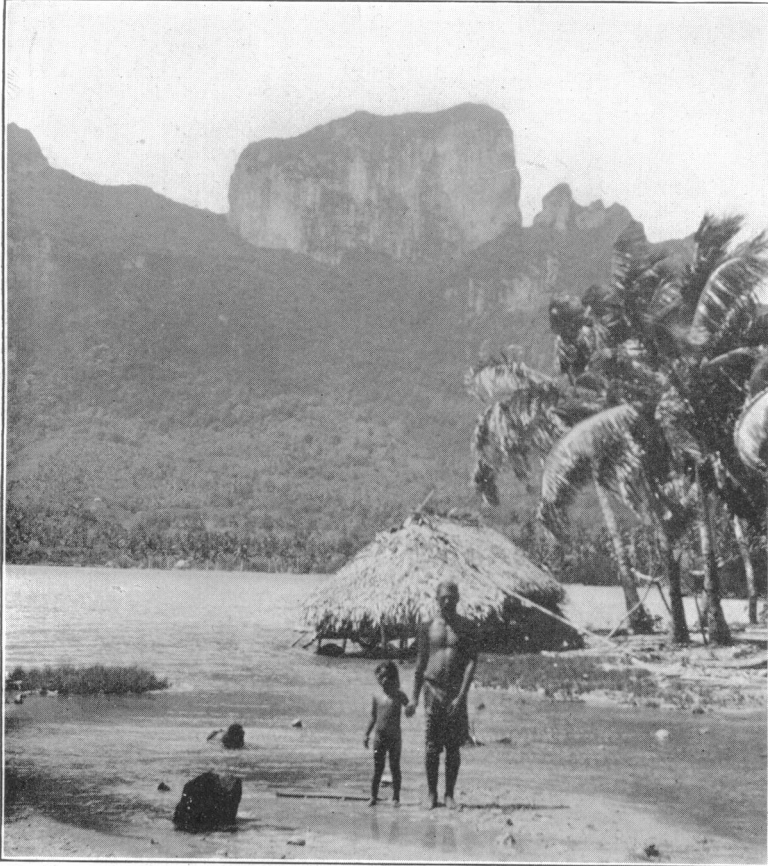
The torrential rains of the tropics have for ages been beating down upon these elevated coral islands so that the whole surface is a riot of jagged projections. If flames were by a magician's wand suddenly turned to rock, they would not be more grotesque or flaring than these knife-edged masses which everywhere project over the surface of an elevated coral island. Here and there and everywhere the mouths of treacherous caverns yawn to entrap the traveler. So clinker-like is this barren rock which rings with a metallic sound when struck, that the non-geologist at once concludes that the island is volcanic, and only the sight of corals heads imbedded here and there in the scoriaceous-looking mass will convince him that he is treading upon an elevated reef. One's boots are torn to shreds, yet the bare-footed natives leap from crag to crag uninjured; a marvellous example of the superiority of natural shoe-leather.

The soil of these islands collects in the numerous crevices, and here the banana grows in the dark-red ferruginous earth that gathers in the bottom of many a pit. Thus the older these islands, the deeper does their soil become, so that at Namuka, Vavau, or Eua in Tonga, or in Niue, we find the surface covered with a rich rusty soil which supports a vegetation almost as varied as that of the volcanic islands.

Only half conscious of the present, wantonly forgetful of the past and heedless of the future, life in the south seas passes as a day-dream, a reverie aimless as the airs that trifle among the palm leaves only to lapse into the nothingness of things that were. Yet nature in the

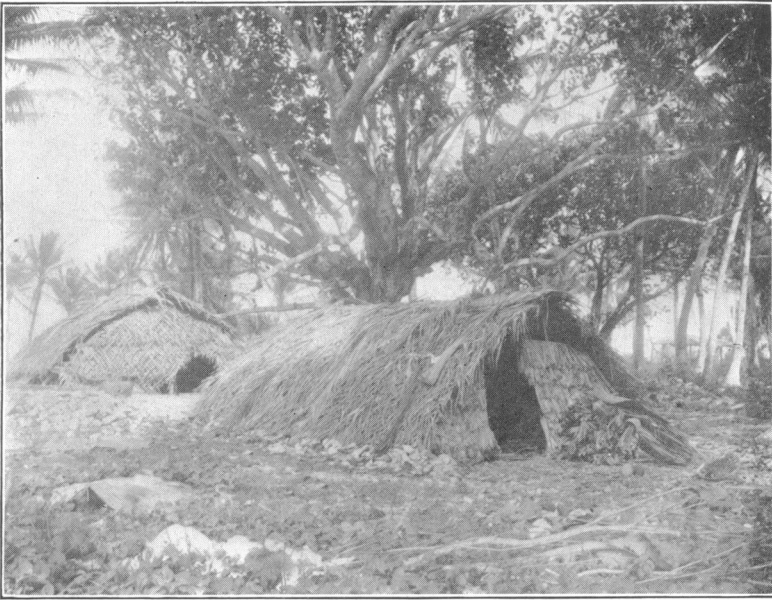


tropics is a trixy jade, and at times drops her seductive, soothing ways and rushes headlong into tragedy. All other memories may lapse into forgetfulness, but the day and year of the hurricane is recalled, and the story of it passes into myth and is handed down from generation to generation.



THE BASALTIC PEAK OF BORA BORA, SOCIETY ISLANDS, showing the trade wind in the palm trees.

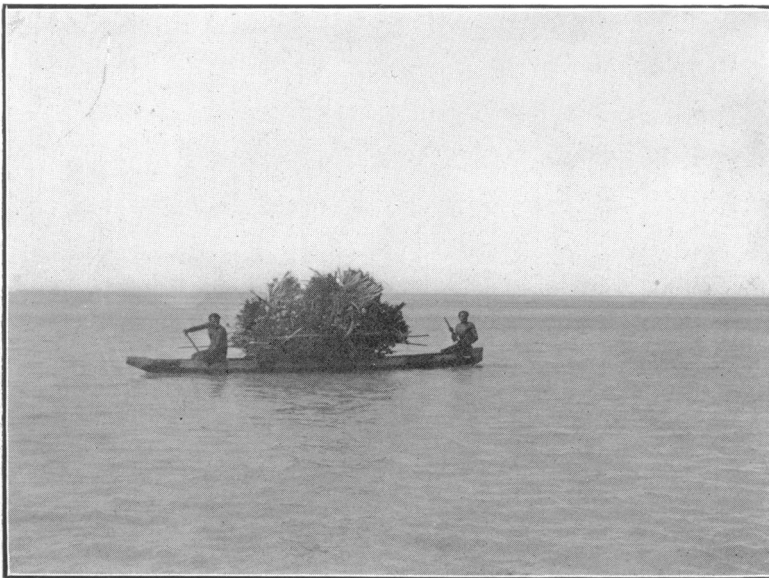
Hurricanes come in the autumn; in that season when the long, hot calms of the tropical summer are about to break into the steady trade winds of the winter months. Thus in September and October in the West Indies, and in February and March in the South Pacific, the heated air rising above the sea is believed to set up an inrush from all sides and a great whirlwind gathers, aided probably by the close proximity of the developing trade winds, and by the rotation of the earth, for the swirl is always contra-clockwise in the northern and clockwise in the southern hemisphere, while the storm as a whole



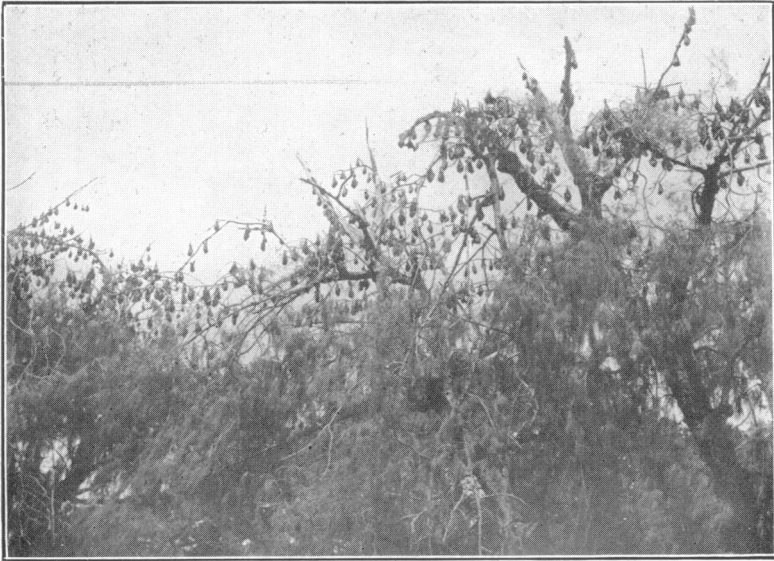
NATIVE HUTS AT JALUIT, MARSHALL ISLANDS.

drifts with the currents of the upper air in a curving course to westward and then away from the equator.

The hurricane of fiction is always preceded by an ominous brooding calm with a sky of sickly green against which palm leaves stand out



CANOE LADEN WITH MATERIALS FOR CONSTRUCTING A HOUSE, FIJI ISLANDS.



SACRED BATS OF HIHIFA VILLAGE, TONGATABU.

like spikes of copper, but in reality the great storm is usually ushered in by gales which increase in violence until they break into a riotous tumult.



COCOANUT PALMS. LAGOON BEACH OF FAKARAVA ATOLL, PAUMOTOS. Robert Louis Stevenson lived within this grove.

The very air becomes an entity, a thing real as the rush of water, overwhelming all in its path. A roar, unearthly in its might, rises at intervals into wild shrieks that overwhelm one's voice. The solid rain drives horizontally and buildings leak more through their sides than through their roofs. The crests of waves are blown far and away, and the sea flattens under the crushing pressure of the storm, the dark waters hidden beneath a white sheet, gray swirls scudding ghost-like over all. The wind comes, not straight, but in fearful twisting swirls and bits of seaweed strike against lighthouse windows one hundred and sixty feet above the sea. One stifles. The air, no longer a pellucid nothingness, has become an enemy against which one can



HOUSE AT PAPARA, TAHITI.

not stand; above which one can not shout, and, in the mighty presence of which, man is an ant-like thing, his smug assumption of mastery over nature a ridiculous pretence. There is no protection anywhere, even the strongest, highest wall serves but to create a maelstrom behind it.

The trunks of stately palms bend humbly to the onrush until they thrash upon the ground, or tearing loose fly upward into the vapor of the storm. Great trees fall, but one hears no crash; houses change in shape and crumble and there is no noise from them, for all sounds of earth are as silence in the presence of the vast voice of the air.

Then, after hours that seem as years, as if all nature had fallen

into war and peace could never come again, the wind unexpectedly ceases and the demon of the storm smiles down upon a blighted world. A candle flame may live in the sullen air, yet all around the horizon lies the black wall of the hurricane glistening in silver where it presses on the sea, and a confusion of huge waves come toppling in from all directions, crashing one against the other, and the barometer sinks to its lowest level. Afar off, one hears again the dull roar, then onward it comes with sudden fury, but reversed in direction, to finish the work of destruction it had but half accomplished.

After all is over the sun—the long-forgotten sun—shines out upon a land, hideous in its ruin. The forest lies in shattered skeletons and dangling here and there are blackened rag-like things that once were leaves. The houses of the village lie shapeless, strewn among the common wreckage of the palms where the great waves let them lie, and strange rocks weighing tons have risen from the sea as monuments to the reality of nature's awakening in a region where once she seemed but to dream and soothe with gentle airs and flirt with all things real.<sup>1</sup>

Yet tropical nature knows no mourning and laughs at death and ruin. New life seizes covetously the lost places of the old and in a few years only the trained eye of the native can detect traces of the work of the great hurricane.

Once or twice in every generation each island is devastated by such a storm. Yet so wanton is tropic life, so heedless, listless and resigned to things that are, that nowhere in the South Seas have the natives taken the trouble to construct hurricane-proof refuge houses into which the village might retreat in time of need.

<sup>1</sup> Such a rock is to be seen upon the reef-flat of Lottin Harbor, Kusaie Island in the Carolines. It is 15 feet long, 8 feet wide and 8 feet high.